GAS CONVERSION BURNER

Installation : : Instructions

FORM 260

CHIMNEYS

A chimney of adequate draft and in good condition is essential to proper operation of your heating unit. If the chimney does not meet the following standards, we suggest that the necessary changes be made.

Each central heating plant should have its own flue without any other smoke pipe or vent pipe connections. If it is necessary for other connections to the same chimney, the suggestions as outlined in detail 4 of Figure 1 should be followed.

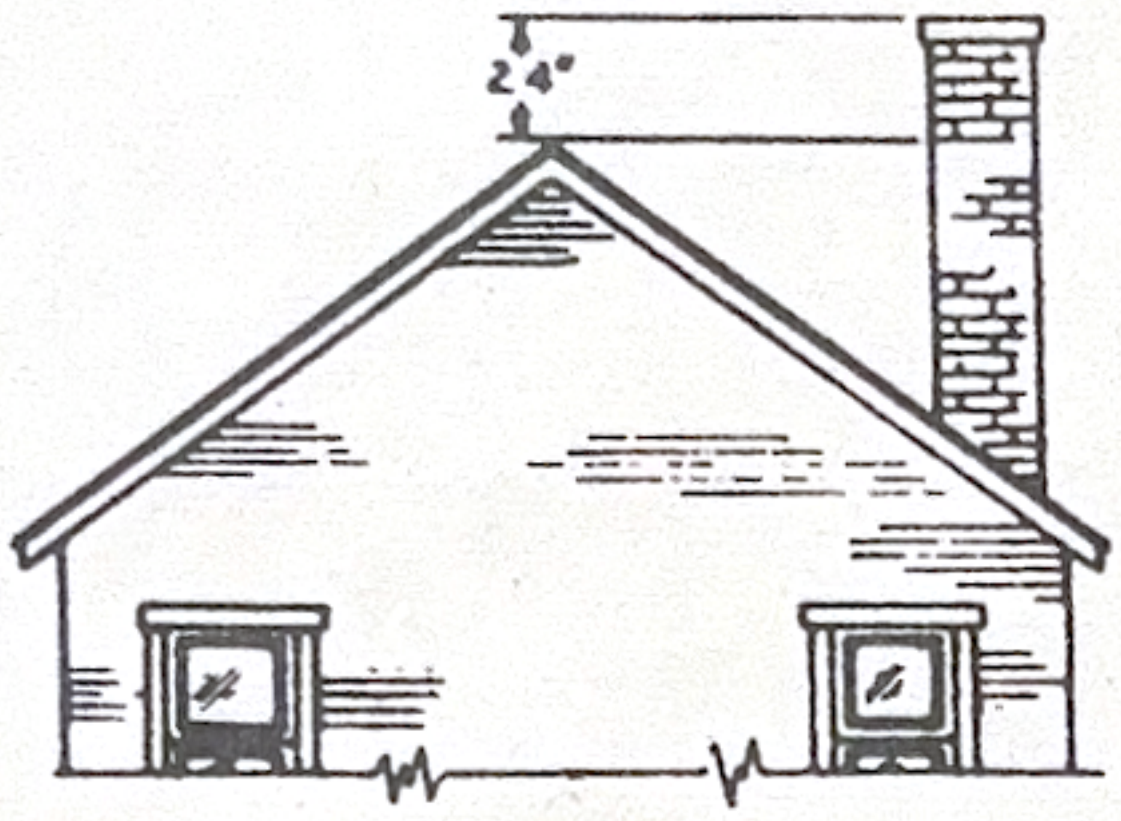
All joints of the chimney must be tightly cemented.

The inside of the chimney should be free of all obstructions. Such as, loose bricks and broken pieces of tile.

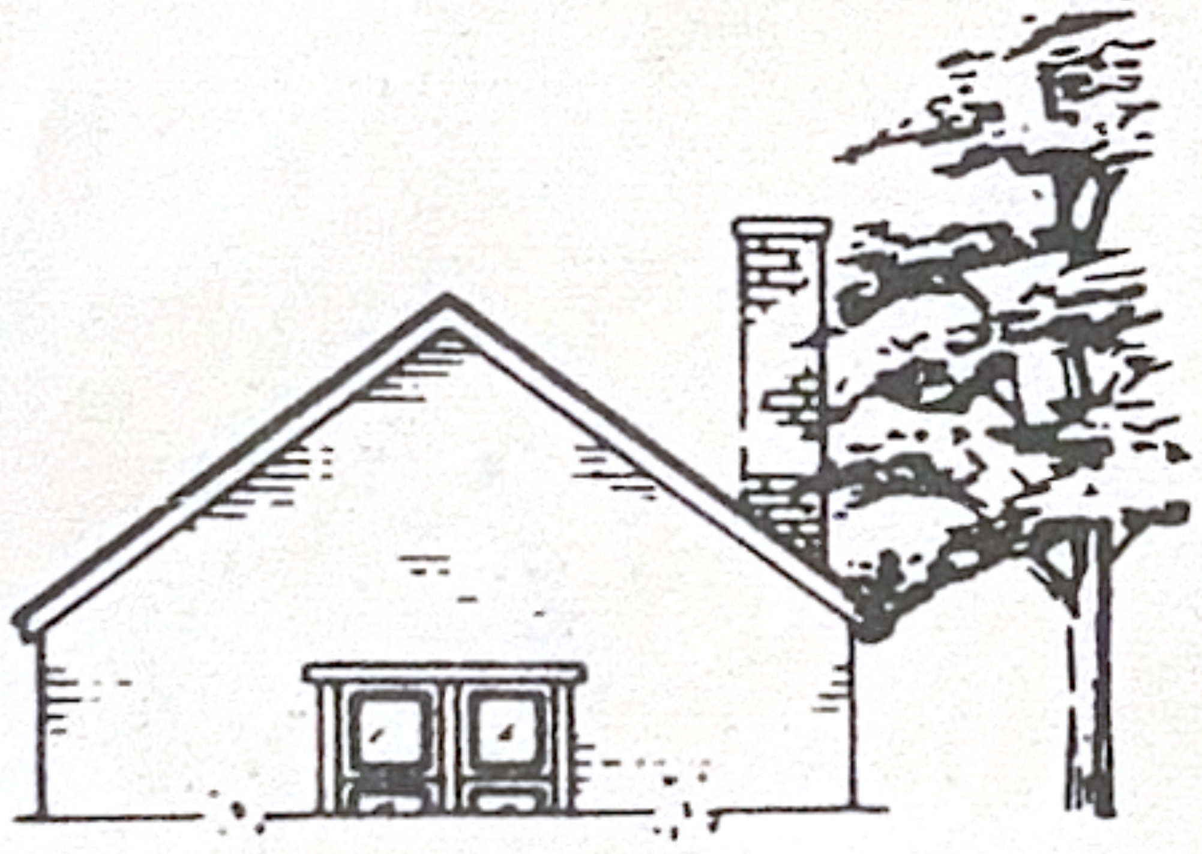
Make sure there are no openings in the partitions separating divided flues. All cleanout doors must fit tightly.

A thimble (Detail 3) should be used to connect the vent pipe to the chimney, so that the vent pipe may be readily removable in case of replacement.

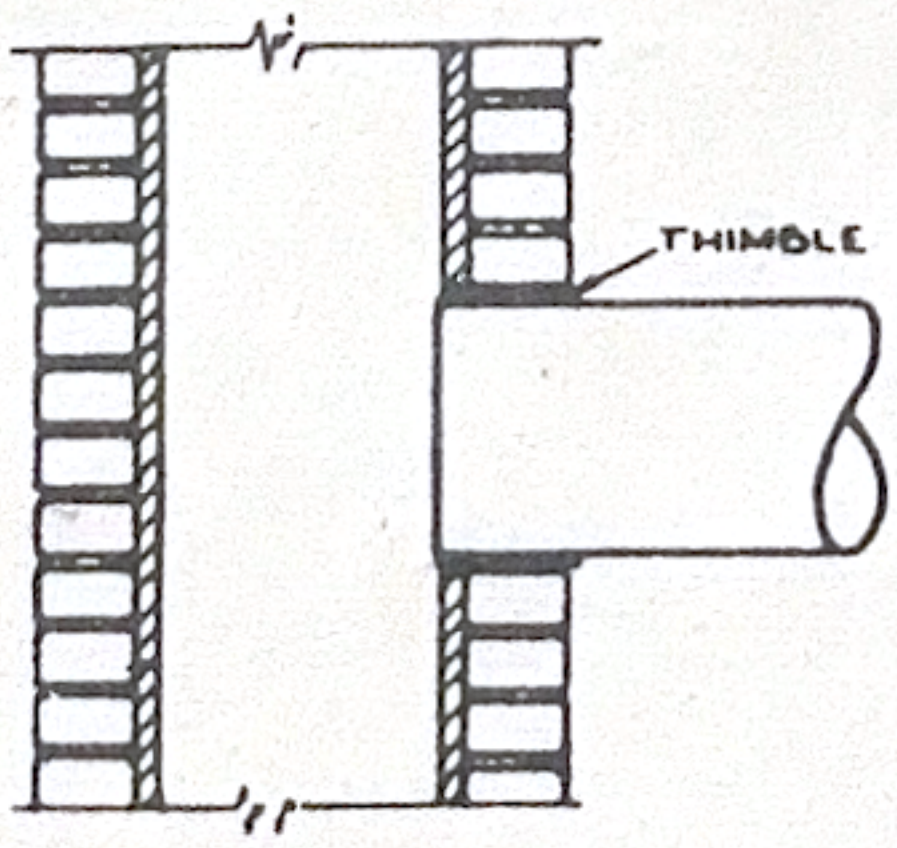
Where the existing chimney is inadequate, then a chimney liner should be installed according to your local codes and regulations.



❶ The chimney height will be determined by surrounding roof and trees. Chimney should extend at least 24-in. above high point of roof with no obstructions from nearby roofs, trees.

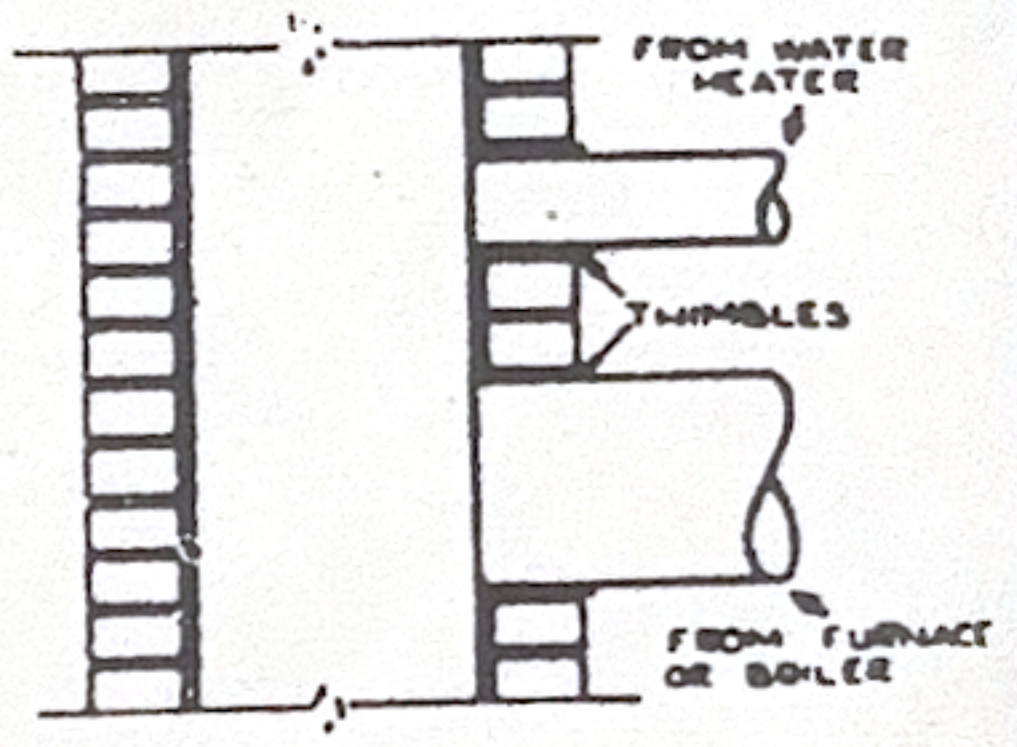


❷ Trim or remove any nearby trees that would interfere with the chimney draft.

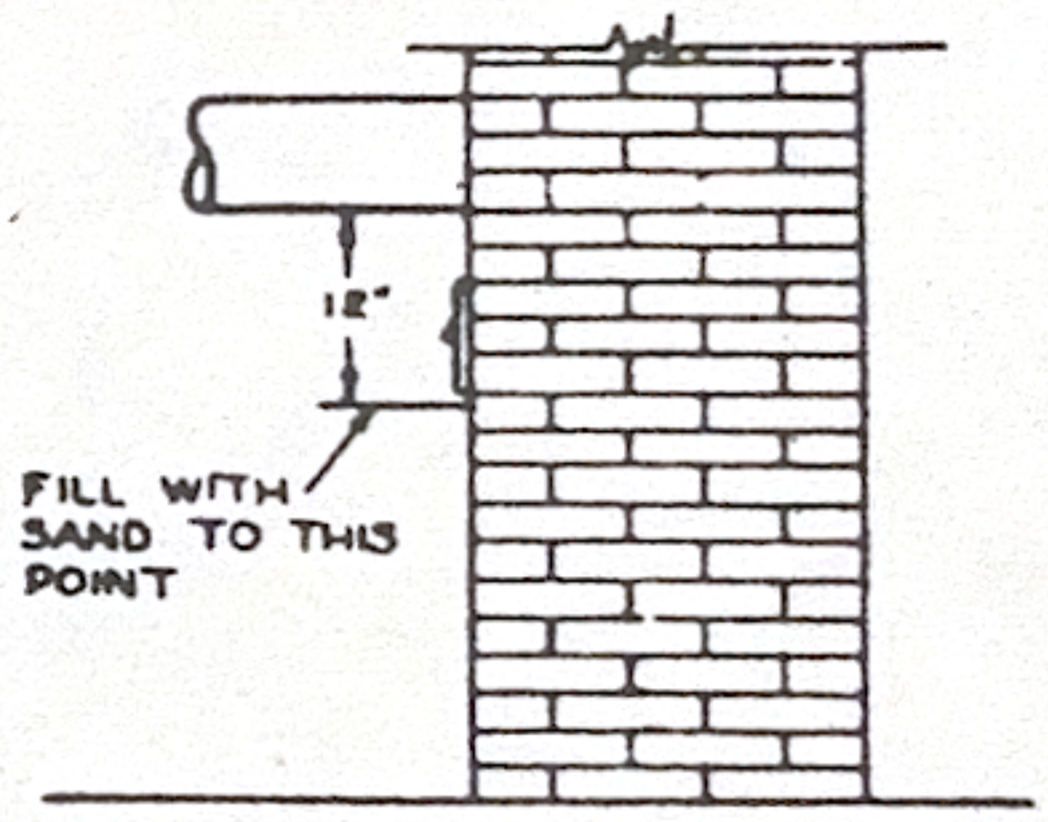


❸ Vent pipe should extend only to (and not beyond) inside wall of chimney. Cement vent pipe tightly into chimney opening.

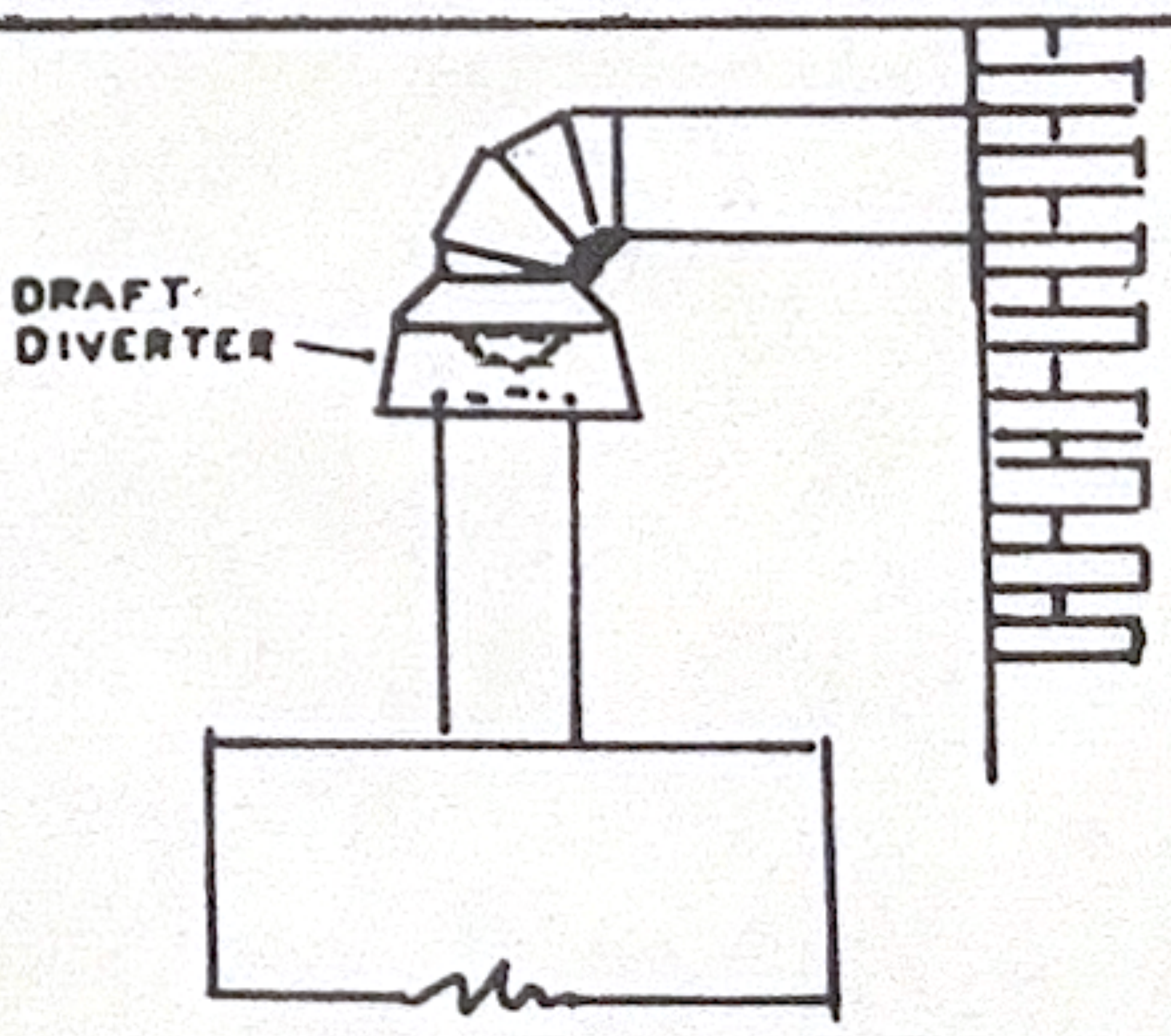
AREA OF FLUE IN CHIMNEY MUST AT LEAST EQUAL THE LARGEST FLUE PLUS 50% OF THE AREA OF THE ADDITIONAL FLUES.



❹ If chimney is used for a tank heater, in addition to boiler or furnace, smoke pipe from tank heater must connect into chimney above smoke pipe from boiler or furnace.



❺ In cases where flue extends to basement floor, draft can usually be improved by filling base of chimney with sand to within 12 inches of smoke pipe and relocating cleanout door.



❻ Gas-fired units will require less draft than coal fired, however, a chimney flue of adequate draft and capacity is required. An AGA draft diverter must be installed on all gas-fired heating units.

PREPARING HEATING PLANT

Before preparing the furnace or boiler it is suggested that a careful check be made to be certain that all the parts and material necessary for making a complete installation are available so that the work can be completed without undue delay.

Remove all soot, scale and ash inside the furnace or boiler, particularly in flue passages.

COAL FIRED UNITS

Fasten or cement feed door slide in closed position. File latch on feed door so that it can open with a reasonable direct pull without being lifted. Remove grates, shaker bars and ash pit door.

WARM AIR FURNACES

In steel furnaces ceramic or fire bricks inside the fire box should be removed. Carefully inspect for leaks between or in fire pot and radiator. Remove part of the outer casing at two or three points and insert an electric lamp inside the fire box. Light will disclose any loose joints, cracks or holes. Under no circumstances should refractories be installed in an attempt to repair a cracked fire pot. Badly cracked or broken castings should be replaced. All joints and cracks should be tightly sealed with furnace cement.

STEAM OR HOT WATER BOILERS - These should be drained and cleaned if necessary. Fire brick in wet leg boilers should be removed except from the floor. Push nipple joints should be protected from direct flame impingement. Inspect fire brick in dry leg boiler to be sure it is in good condition.

WARNING - All ceramics used for a gas combustion chamber should be capable of withstanding at least 2000F in order to prevent disintegration.

COMBUSTION AIR

Successful operation of any heating system depends on a continuous and adequate supply of air to the burner and a well constructed chimney of adequate size and height. Both requirements are particularly important for the successful operation of a gas burner.

INSTALLATIONS IN CONFINED SPACES

Two openings shall be provided each with a free area of at least one square inch per 1000 Btu of input. Each opening must have at least 100 square inches; One at top and one at the bottom for the admission of air. Additional details are available in "American Standard Installation of Domestic Gas Conversion Burners, Z21. 8-1958". Copies may be obtained from the American Gas Association, 420 Lexington Ave.. New York 17, New York for twenty-five (25) cents.

INSTALLATION OF BURNER

The burner should be mounted in the oil burner blast tube opening in the furnace, as shown in Fig. 4. Maximum blast tube depth is 13 inches with burner fully extended. In most blast tubes the burner tube should be extended so it is even with the inner end of the blast tube. In short blast tubes the fully retracted burner may extend into the combustion chamber. See Fig. 9 for adjustment instructions.

INSTALLING GAS PIPING -

A separate line should be run from the meter to the burner. The pipe size should be one (1) size larger than that of the manual main shut-off valve. In the event that the pipe distance from the meter is in excess of 35 feet, the pipe size should be two (2) sizes larger than **that of the manual shut-off valve. Use steel pipe and malleable fittings for gas service line and support gas line with pipe hangers. If the pipe size must be reduced use reducers. Avoid the use of bushings. Remove all burrs and other obstructions from the pipe. Do not bend pipe; use ells or other fittings to bring the pipe to where it is required. See fig. 3.**

Where combination valves are used the burner is completely assembled. Where combination valves are not used a manual shut-off valve with a pilot valve tapping at the inlet end is provided with the burner. The small pilot valve is installed in the opening provided in the main manual valve on the meter side, so that pilot gas may be obtained with the main valve shut. The main shut-off should be installed about 5 feet above the floor. The gas line should extend to the floor and be capped. A tee should be placed at the level of the burner manifold. Connect the gas pipe to the burner manifold by means of the ground joint union. Pipe dope that is resistant to the action of LP gases must be used. Gas piping should be checked for leaks with a soap solution. Under no circumstances should a match, candle or other source of ignition be used.

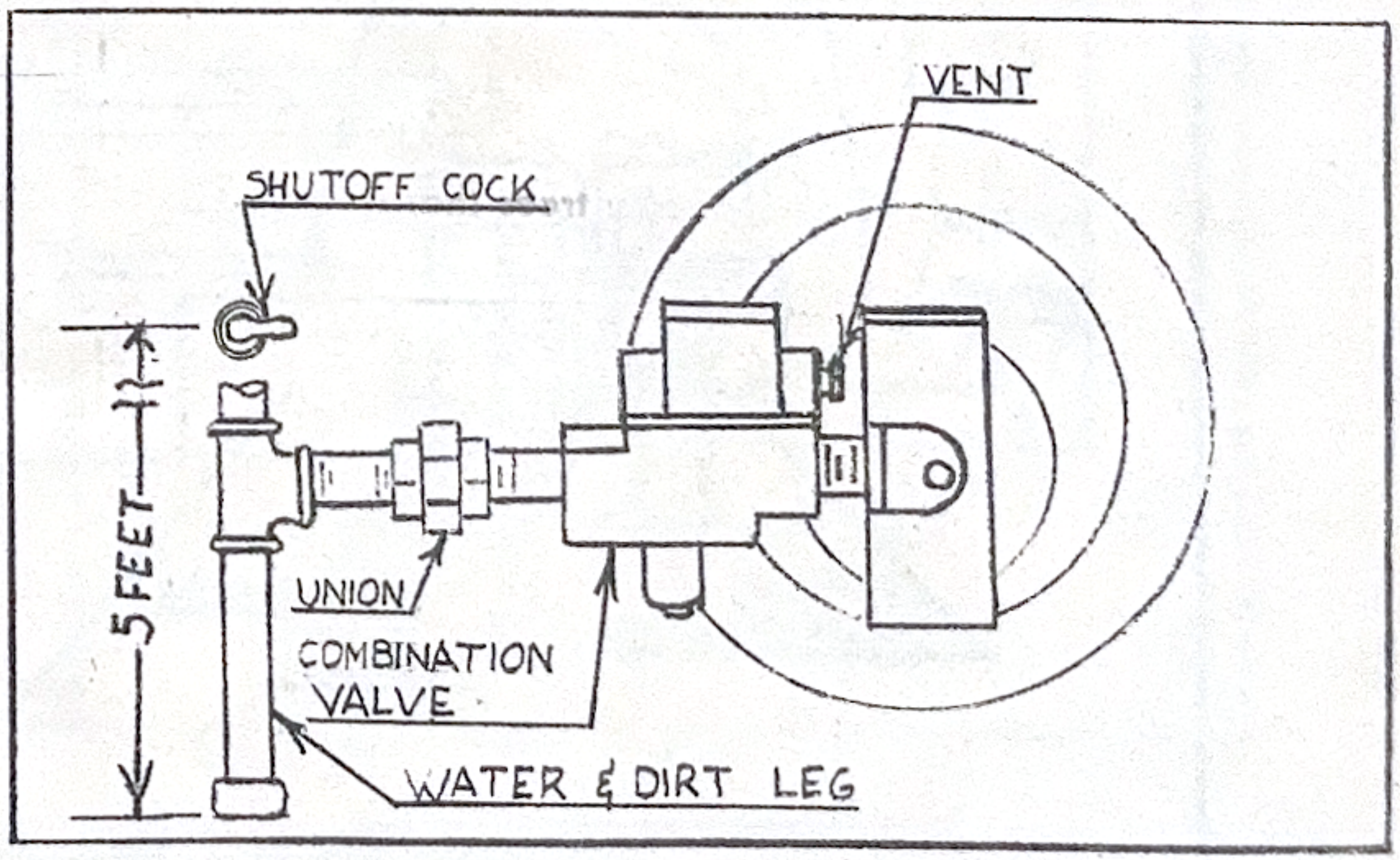
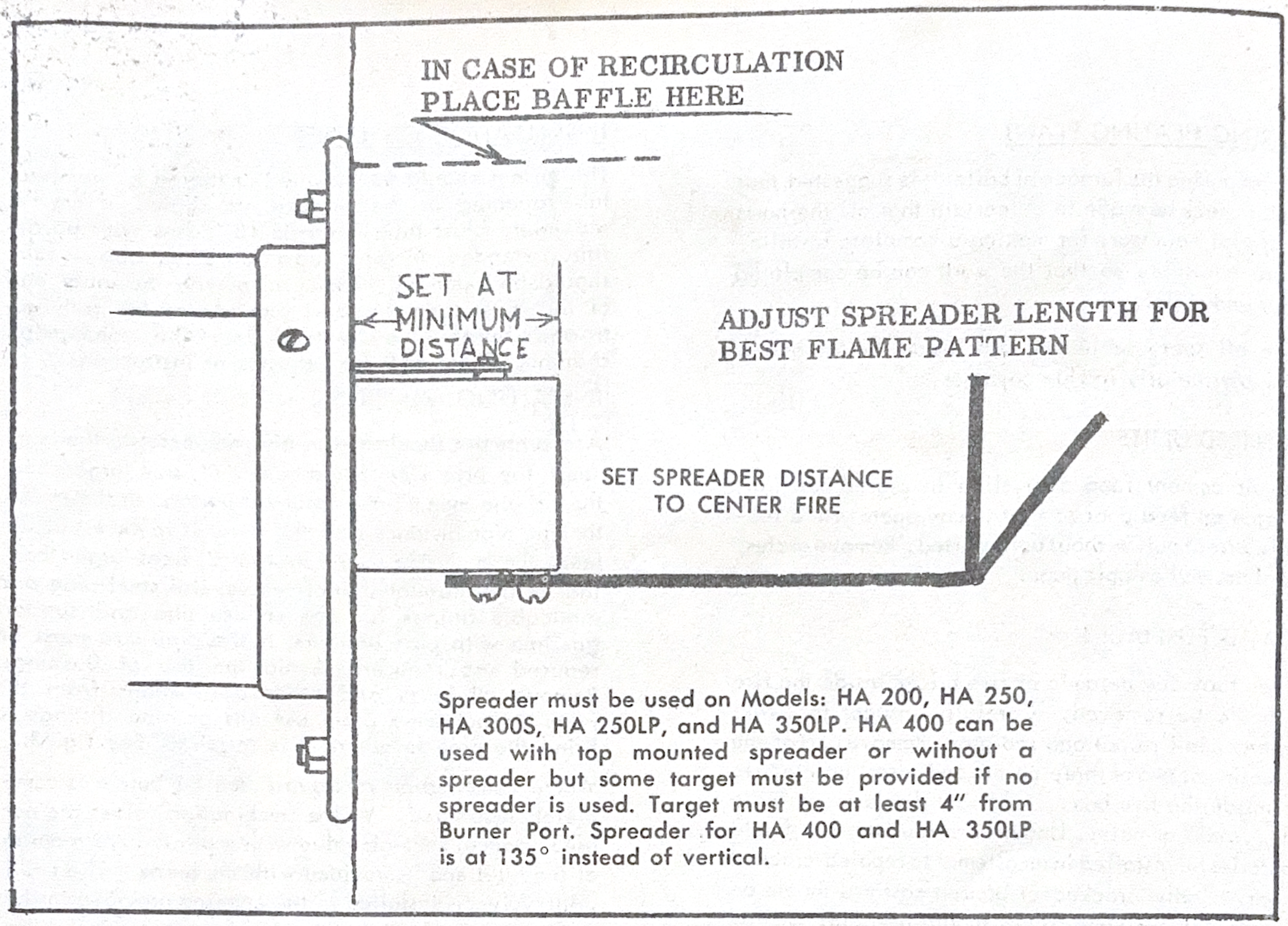
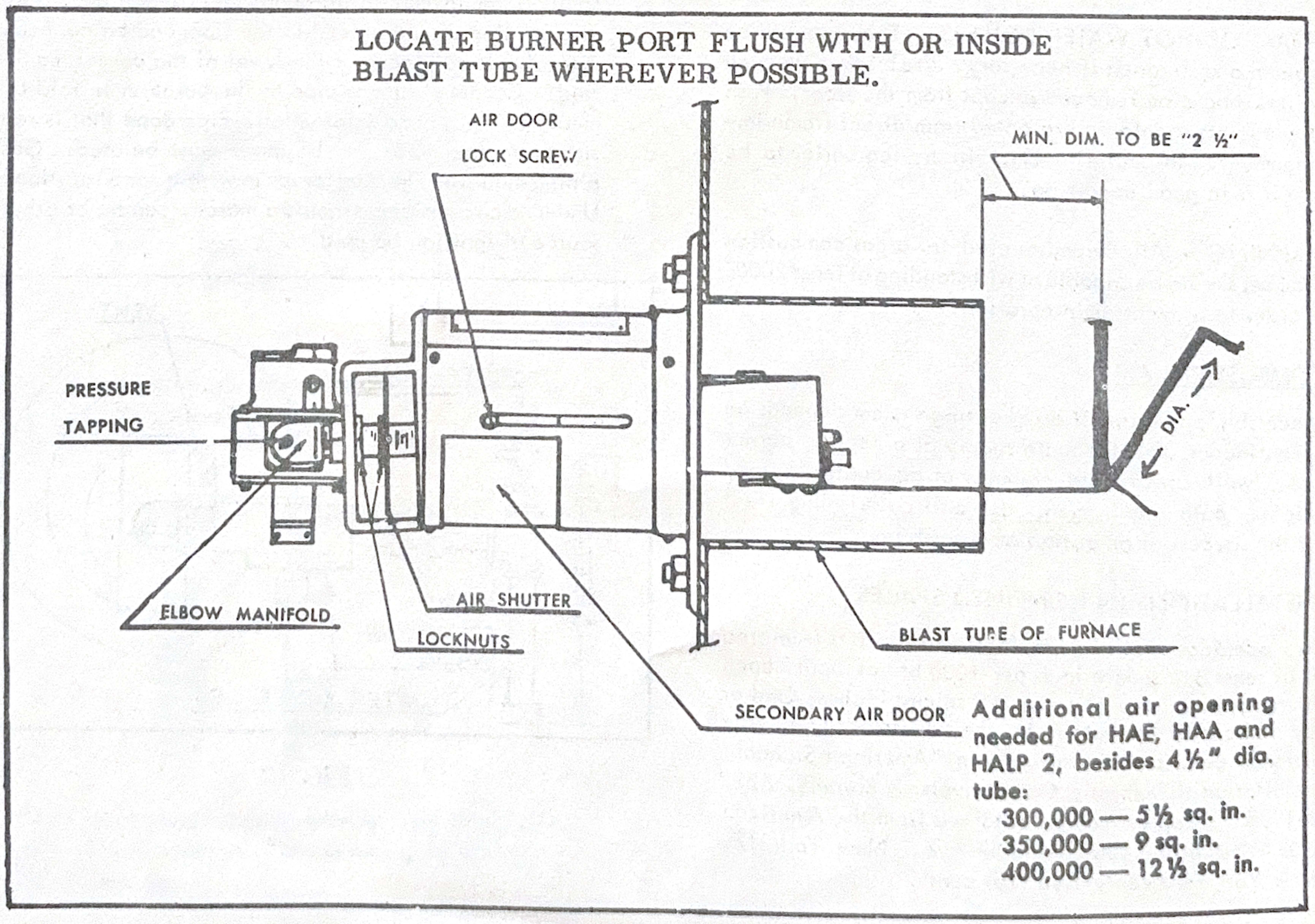


FIG. 3


IN CASE OF RECIRCULATION
PLACE BAFFLE HERE
SET AT
MINIMUM
DISTANCE
ADJUST SPREADER LENGTH FOR
BEST FLAME PATTERN
SET SPREADER DISTANCE
TO CENTER FIRE

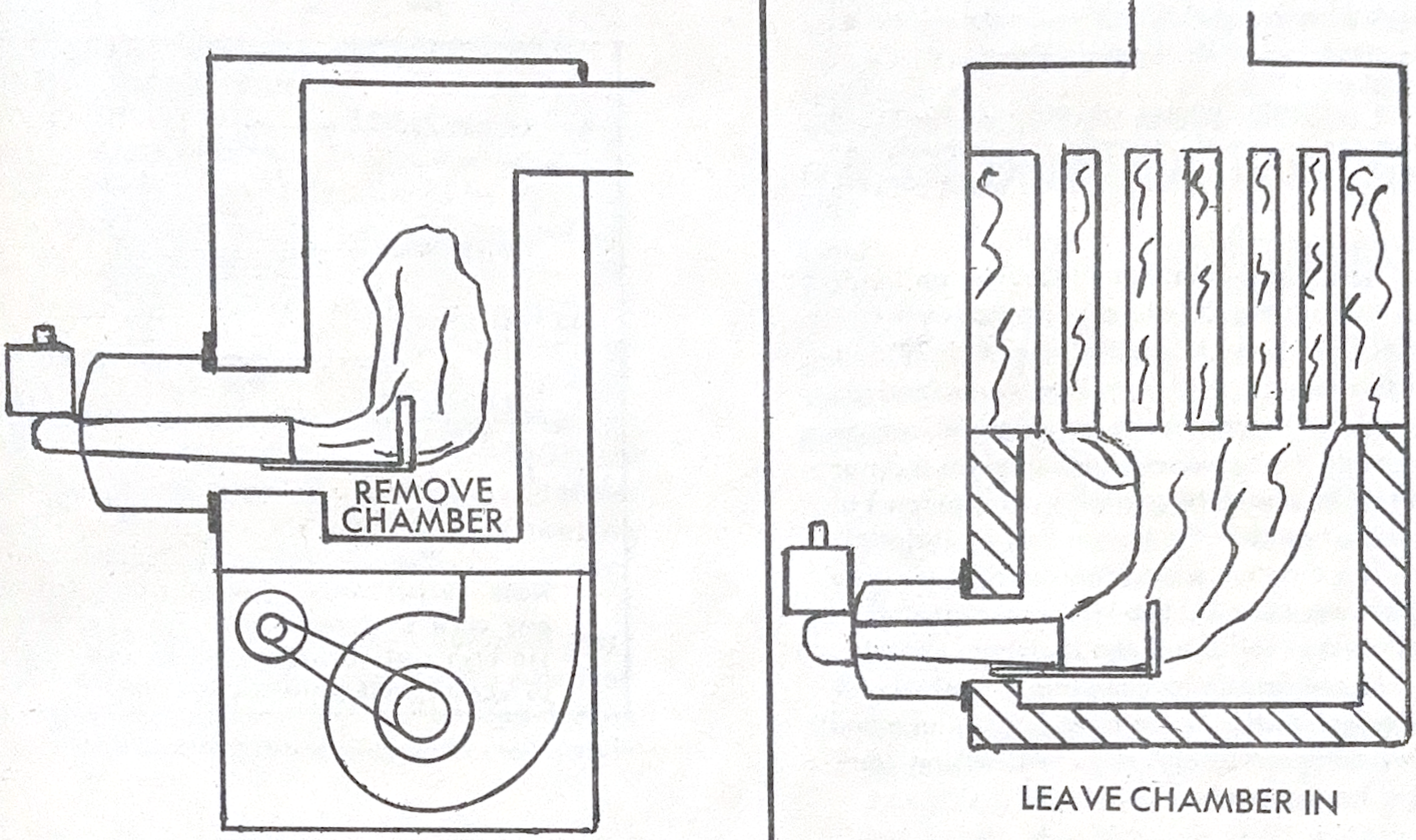
Spreader must be used on Models: HA 200, HA 250, HA 300S, HA 250LP, and HA 350LP. HA 400 can be used with top mounted spreader or without a spreader but some target must be provided if no spreader is used. Target must be at least 4" from Burner Port. Spreader for HA 400 and HA 350LP is at 135° instead of vertical.


LOCATE BURNER PORT FLUSH WITH OR INSIDE
BLAST TUBE WHEREVER POSSIBLE.
AIR DOOR
LOCK SCREW
MIN. DIM. TO BE "2 ½"
PRESSURE
TAPPING
DIA.
ELBOW MANIFOLD
AIR SHUTTER
LOCKNUTS
BLAST TUBE OF FURNACE
SECONDARY AIR DOOR

Additional air opening needed for HAE, HAA and HALP 2, besides 4 ½" dia. tube:

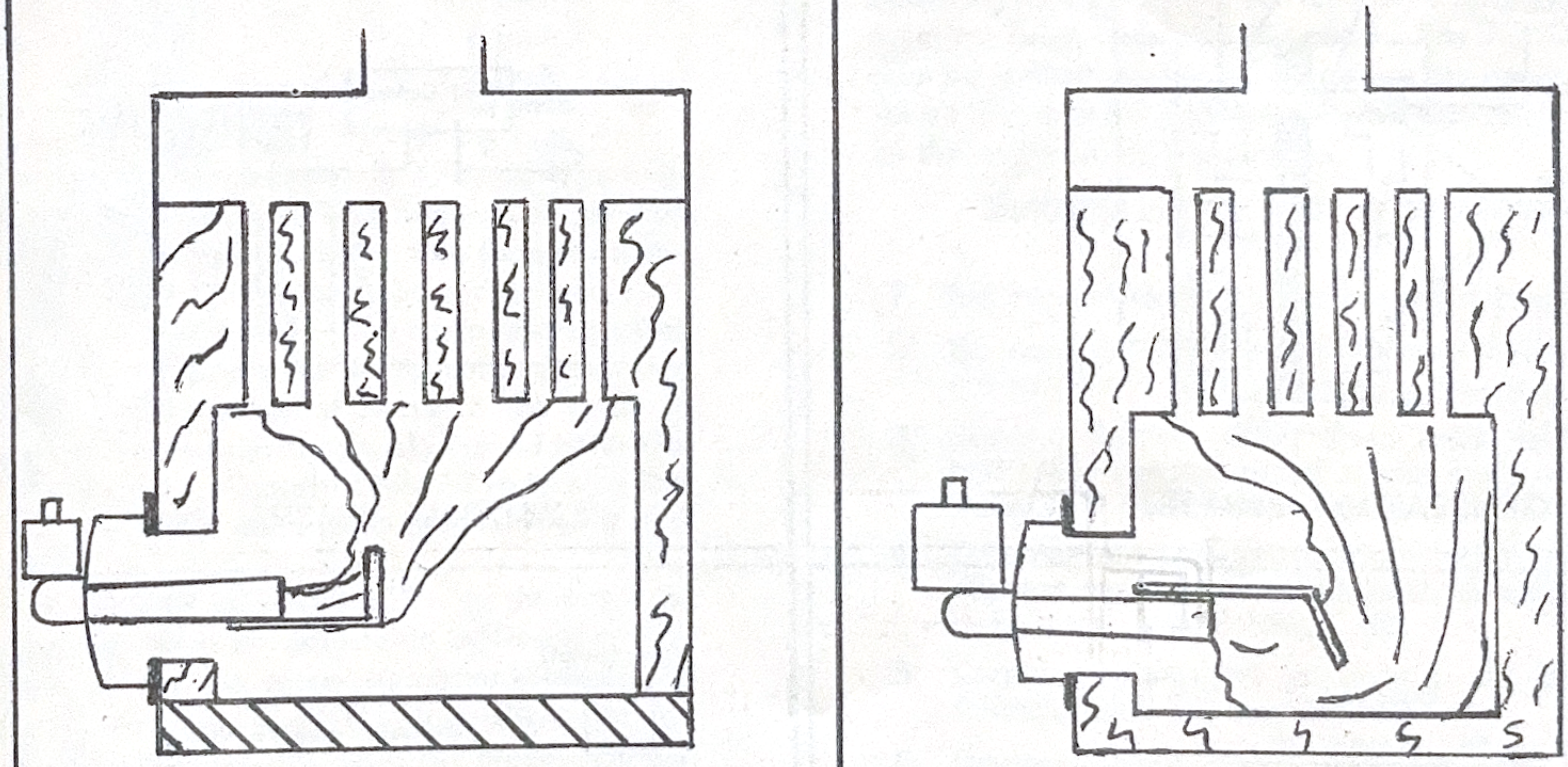
300,000 — 5 ½ sq. in.
350,000 — 9 sq. in.
400,000 — 12 ½ sq. in.

FIG. 4



1. WARM AIR FURNACE

LEAVE CHAMBER IN
2. DRY BASE BOILER



REMOVE CHAMBER
3. WET LEG BOILER

REMOVE CHAMBER BUT
COVER PUSH NIPPLES
4. WET BASE BOILER

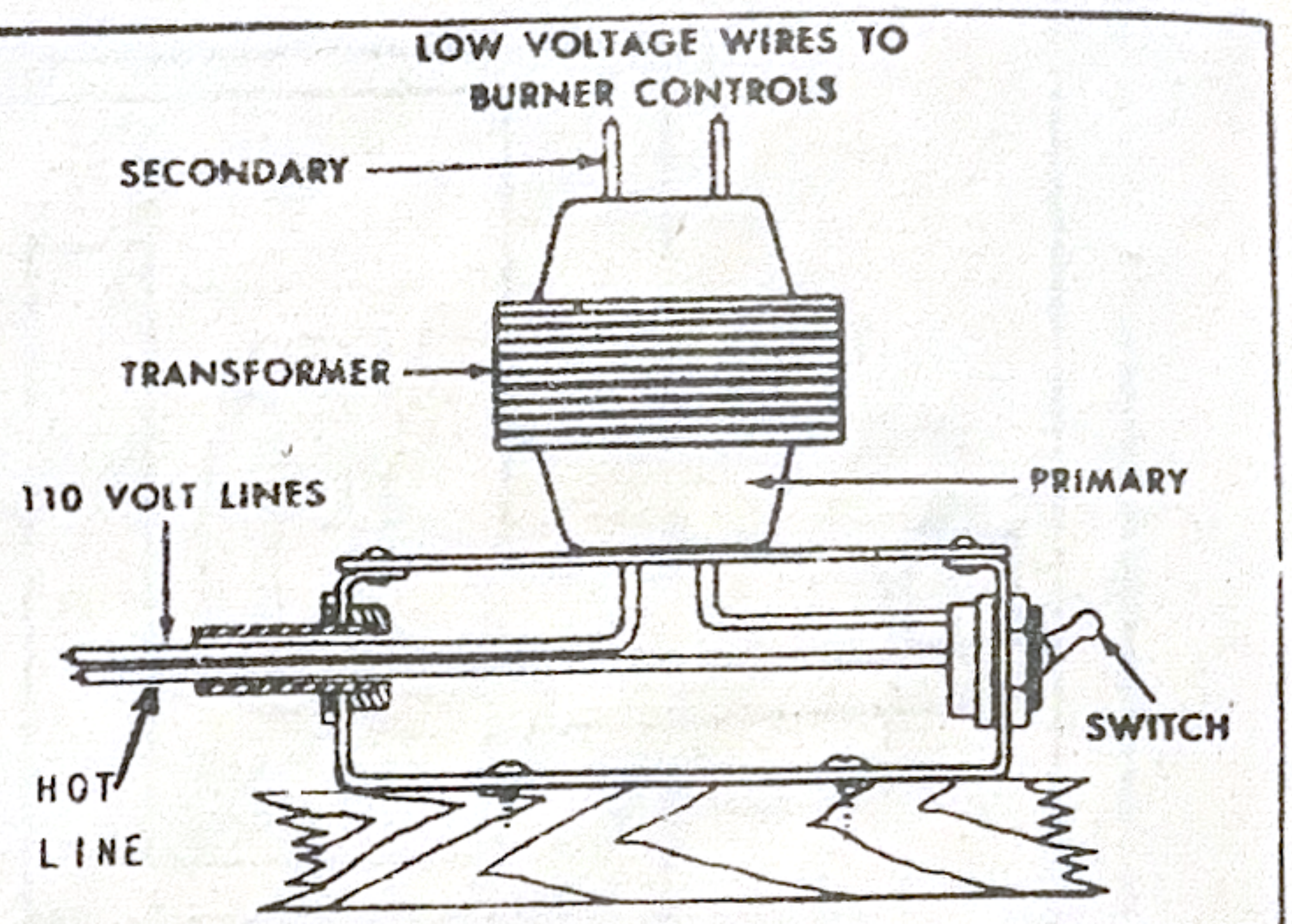
* TOP MOUNTED SPREADER ON HA 400 ONLY
MOUNT SMALLER MODELS AS SHOWN IN FIG. 3

FIG. 4A
INSTALLATION

INSTALLING ELECTRIC WIRING - All electric wiring must conform to the National Electric Code, local building code and local Utility requirements.

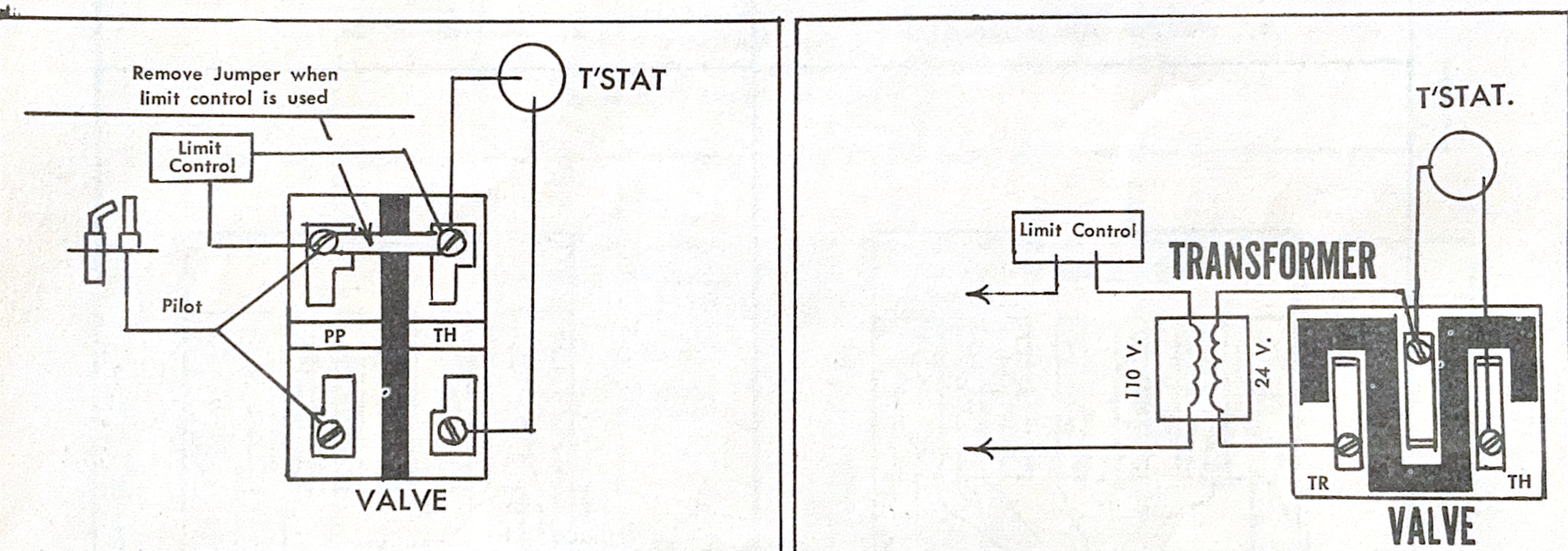
Self generating controls require no outside source of power. Follow the wiring diagram in this manual. Be sure to solder any connections that are not made on terminal blocks.

Power for the heating system should be from an independent circuit separately fused. The transformer furnished is plainly marked. One set of leads is marked 115 volts; this is for connection to the power service. See Figure 5. This connection should be made in conduit, BX or loom and the transformer mounted on a junction box. An "On and Off" switch should be part of the 115 volt circuit so that the burner can be isolated. Follow the wiring diagram shown in Figure 6. Failure to exercise extreme care in the wiring may result in damaged controls and failure of the burner to operate. The secondary of the transformer is plainly marked "24 volts". This is generally considered low voltage and No. 18 bell wire can be safely used. All wiring connections should be soldered.


LOW VOLTAGE WIRES TO BURNER CONTROLS
SECONDARY
TRANSFORMER
110 VOLT LINES
PRIMARY
SWITCH
HOT LINE

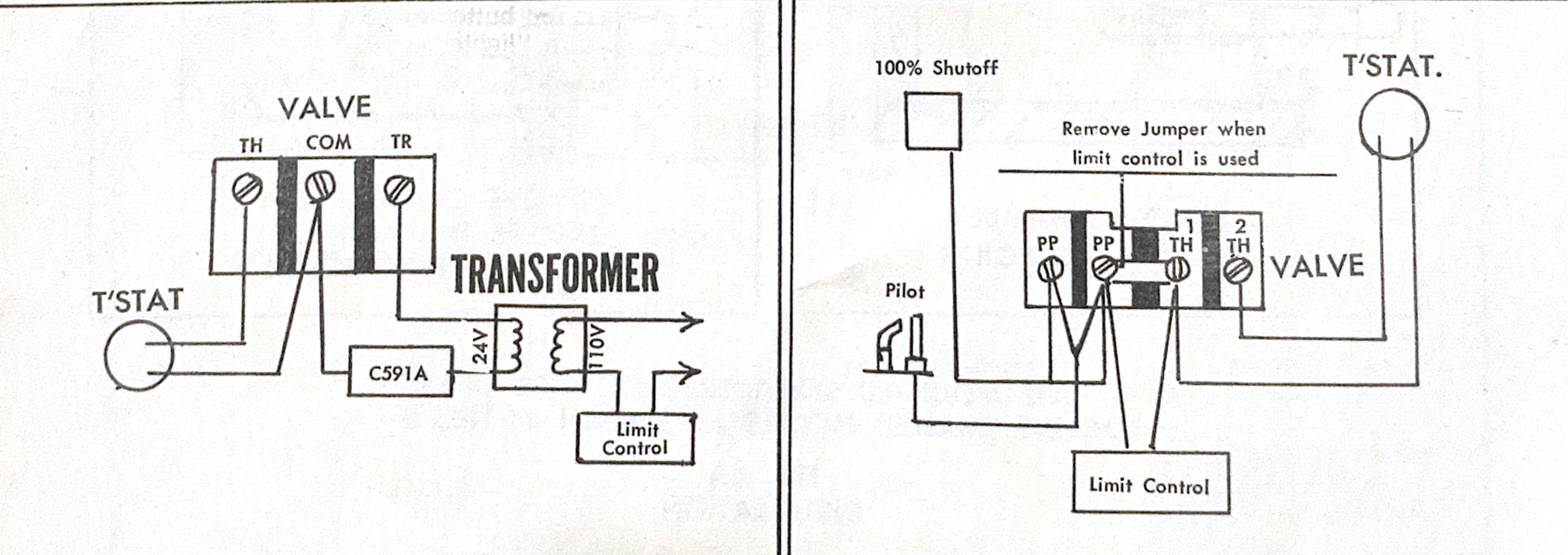
NOTE: TRANSFORMER IS MOUNTED ON A CONDUIT BOX WITH SWITCH MOUNTED ON SAME BOX. WIRE 110 VOLT LINE WITH CONDUIT, B.X.CABLE OR LOOM, IN ACCORDANCE WITH LOCAL CODE.

FIG. 5 TRANSFORMER WIRING


Remove Jumper when limit control is used
T'STAT
Limit Control
Pilot
PP
TH
VALVE
T'STAT.
Limit Control
TRANSFORMER
110 V.
24 V.
TR
TH
VALVE

SELF GENERATING VS8138A VALVE

24 VOLT V8139A VALVE


VALVE
TH
COM
TR
T'STAT
TRANSFORMER
24V
110V
C591A
Limit Control
100% Shutoff
T'STAT.
Remove Jumper when limit control is used
PP
PP
1 TH
2 TH
VALVE
Pilot
Limit Control

24 VOLT V88 VALVE

SELF GENERATING VS8187 VALVE

FIGURE 6 WIRING DIAGRAMS.

INSTALLING VENT PIPING - Select the proper size of galvanized vent pipe from Table I. Where flue outlet is larger than vent pipe place a reducing collar on the flue outlet. See fig. 1.

INSTALLING DRAFT DIVERTER - Draft diverters should be galvanized and be the same size as the vent pipe. Select an AGA listed diverter that will fit in the space between the heater and the chimney opening and add sufficient vent pipe to complete the installation. All vent pipe should slope upward toward the chimney at least 1/4 inch per foot of length. After the vent pipe and draft diverter are in place, secure all connections with sheetmetal screws. Draft and check doors and other openings in the vent pipe or chimney should be sealed shut. This does not include the relief opening of the draft diverter. Also this relief opening should be unobstructed for a distance of at least two vent pipe diameters below the diverter opening.

According to the requirements for installation of domestic gas conversion burners approved by the American Standards Association, no moveable flue pipe damper shall be permitted on any gas conversion burner installation.

TABLE I

6500 Btu per square inch of flue area is the maximum allowed.

BURNER INPUT BTU PER HOUR	DRAFT DIVERTER AND VENT PIPE SIZE
Up to 120,000	5 inch
120,000 - 160,000	6 inch
160,000 - 250,000	7 inch
250,000 - 325,000	8 inch
325,410 - 410,000	9 inch

If the vent pipe is longer than ten feet, or contains more than two elbows, use the next size larger pipe and draft diverter. For revertible or diving flue furnaces (down draft type), use one size larger pipe and diverter.

DETERMINING INPUT RATE - The approximate number of Btu needed for a particular house can be determined by multiplying the number of rooms in the house by 25,000. Do not include hallways, closets and bathrooms in this computation. Consult Table III to be sure that the needed rate does not exceed that allowed in that size furnace.

SELECTING PROPER SIZE ORIFICE - In the event the burner does not have an adjustable orifice it will be necessary to select the proper size from Table IV. By opening the primary air and using pliers or wrench. The orifice can be removed, drilled to the proper rate and re-installed.

LIGHTING AND ADJUSTING BURNER

Bleed the gas line to let the air out. This can be done by disconnecting the tubing at the pilot valve and opening the pilot valve. Burn the mixture which comes from the valve. Watch the gas meter until about 1 cubic foot is bled out and then seal the line carefully again. Be sure the air doors on the burner plate are open. Light the burner by following the instructions on the rating plate.

ADJUSTING ADJUSTABLE ORIFICE—Remove brass cap from back of manifold and insert a small screwdriver in the opening uncovered. Engage it in the slot in the needle. The needle should be in a position to provide minimum rate or less. Screw needle out (counter lockwise) until the desired rate is obtained.

CHECKING BURNER INPUT - Use the following formula:

$$\begin{array}{l} \text{Input} \\ \text{Btu per Hr.} \end{array} = \frac{3600\text{x}\text{Heating value of gas}}{\text{Time in Sec. for 1 Cu. ft.}}$$

ADJUSTMENT OF GAS PRESSURE REGULATOR - The gas pressure regulator should be set to 3 1/2 inches of water column pressure at the burner manifold. A tapping is provided on the manifold so this can be checked or so that the pressure can be reset if necessary.

1. Manifold pressure should be set as follows: Manufactured gas 2 1/2" water column, natural gas 3 1/2" water column.
2. To adjust pressure regulator, remove cap on top of regulator, turn adjusting screw out to decrease pressure, turn in to increase pressure.
3. Only small variations in gas flow should be made by means of the gas pressure regulator adjustment. In no case should the final manifold pressure vary more than plus or minus 0.3" water column from the above specified pressures. Any necessary major changes in the flow should be made by changing the size of the burner orifice.

ADJUSTMENT OF PRIMARY AIR - With the burner operating the primary air shutter should be closed until a yellow flame appears on the burner. The shutter should then be opened slowly until the yellow disappears. Lock the air shutter in this position with the lock nut provided on the manifold for this purpose.

BURNER LIGHTING AND SHUTDOWN INSTRUCTIONS

1. Set room thermostat below room temperature.
2. Be sure gas cock and pilot cock (where used) are in "OFF" position for five minutes.
3. Remove burner cover, open pilot lighter cock and place lighted match at red mark on lighter. Open pilot cock (where used).
4. Depress and turn gas cock to pilot position or depress red button on pilotstat, as soon as pilot is lit, turn "lighter cock" off.
5. Continue to depress gas cock or red button one minute, pilot will stay lighted,
6. Replace burner cover, turn gas valve to "ON" position, set thermostat above room temperature.
7. Turn on electric switch (where used) burner will light.
8. Set room thermostat to room temperature.

TO SHUT-OFF BURNER

1. Depress and turn gas cock and pilot cock (where used) to "OFF" position.
2. Turn off electric switch (where used).

ADJUSTMENT OF SECONDARY AIR IN OIL FURNACES OR BOILERS

To properly set a gas conversion burner, a CO_2 analyzer is essential. The following procedure should be followed:

1. Open the secondary door wide.
2. Cut a slot in the flue pipe, between the furnace and draft diverter.
3. Light burner and let it burn for 5-7 minutes until this unit is hot.
4. Restrict the flue as shown in Fig. 7 until the CO_2 is about 9% and the stack temperatures is 550 or less.
5. Allow unit to cool, then try starting cold to be sure that the unit starts properly. If flames roll out the front of the burner, the flue restricter may have to be eased up.

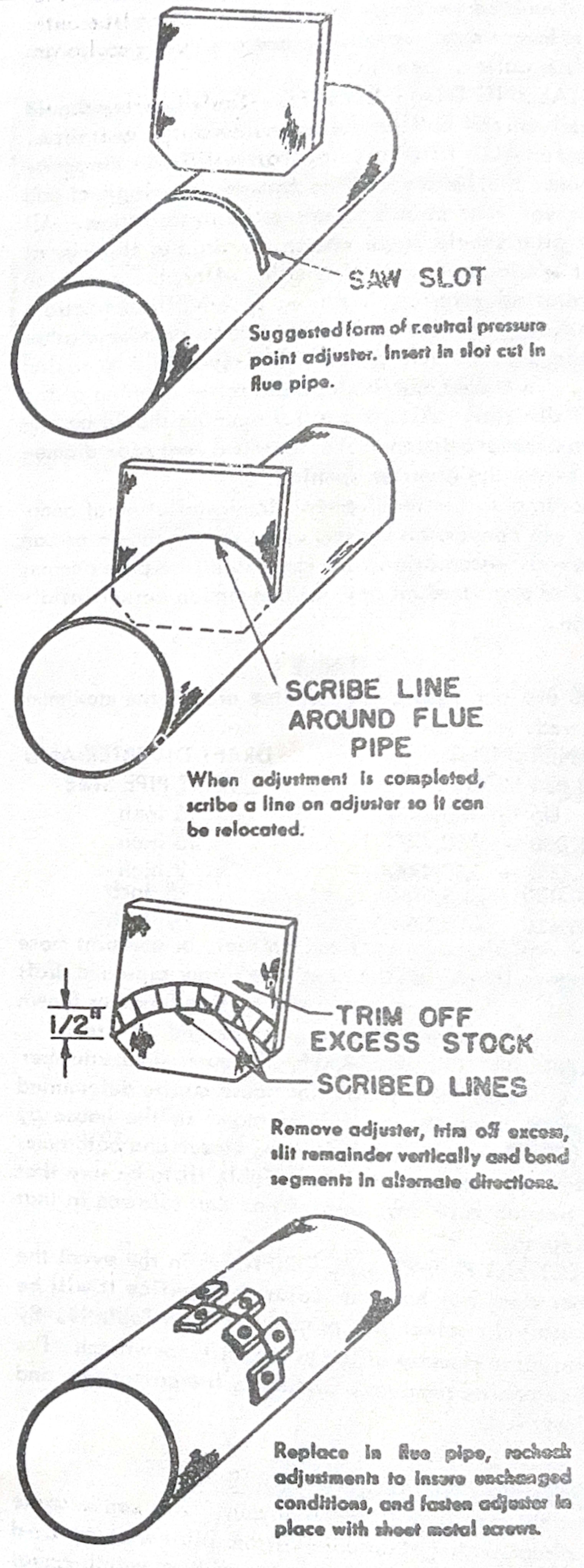
Furnaces with reverted flues must be vented from the top of the combustion chamber and heat exchanger into the flue outlet. Some oil units have a knock out for this purpose. Relieving the reversion will help this situation otherwise the input must be reduced and the flue restricted until a balance is created.

Where insufficient height is available between the burner opening and the flue outlet two methods can be used to create more draft. First of all use the same size pipe all the way up to the draft diverter. Second raise the draft diverter up as high as possible. In all cases place the diverter as close to the furnace as possible.

ADJUSTMENT OF SECONDARY AIR IN STANDARD COAL FURNACES OR BOILERS

The secondary air adjustment is controlled by the door shown in Fig. 3 and by insertion of a sheet metal slide in the flue between the draft diverter and the furnace. Open the doors on the burner and allow the burner to operate for 15 minutes. Open the fire door about 1/8 inch as shown in Fig. 8. Insert the slide in the flue as shown in Fig. 7. If the fire tends to float, open the slide until this tendency disappears. Take a CO_2 reading of the flue products. If this is greater than 8%, open the flue slide. If it is less than 8%, close the flue slide until a value of approximately 8% is obtained.

Now apply the match test shown in Fig. 8. The match flame should blow out all the way up and down the door. Close the doors on the burner until the condition shown in Fig. 8 is obtained. In the event the fire starts to float it will be necessary to ease the doors open and to open the slide in the flue a little. With a little care the condition shown in Fig. 8 can be obtained with a CO_2 reading of 9%. Closing down the air doors on the burner will raise the point at which the match flame blows out, while closing the flue slide will lower it. A few minutes of adjusting these two shutters can produce a conversion burner installation which in many cases will be as efficient as a new gas furnace. When the secondary air is adjusted, fasten the flue slide as shown in Fig. 7 and fasten the doors on the burner with the screws provided.



Suggested form of neutral pressure point adjuster. Insert in slot cut in flue pipe.

When adjustment is completed, scribe a line on adjuster so it can be relocated.

Remove adjuster, trim off excess, slit remainder vertically and bend segments in alternate directions.

Replace in flue pipe, recheck adjustments to insure unchanged conditions, and fasten adjuster in place with sheet metal screws.

FIGURE 7

SUGGESTED CONSTRUCTION OF A NEUTRAL PRESSURE POINT ADJUSTER

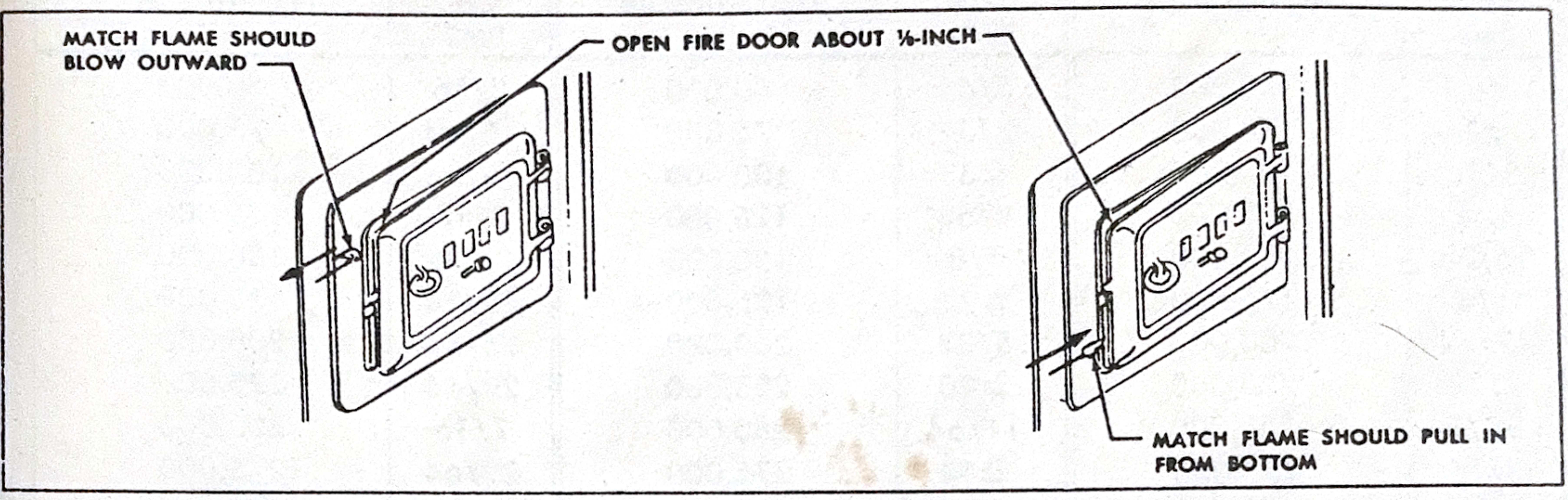
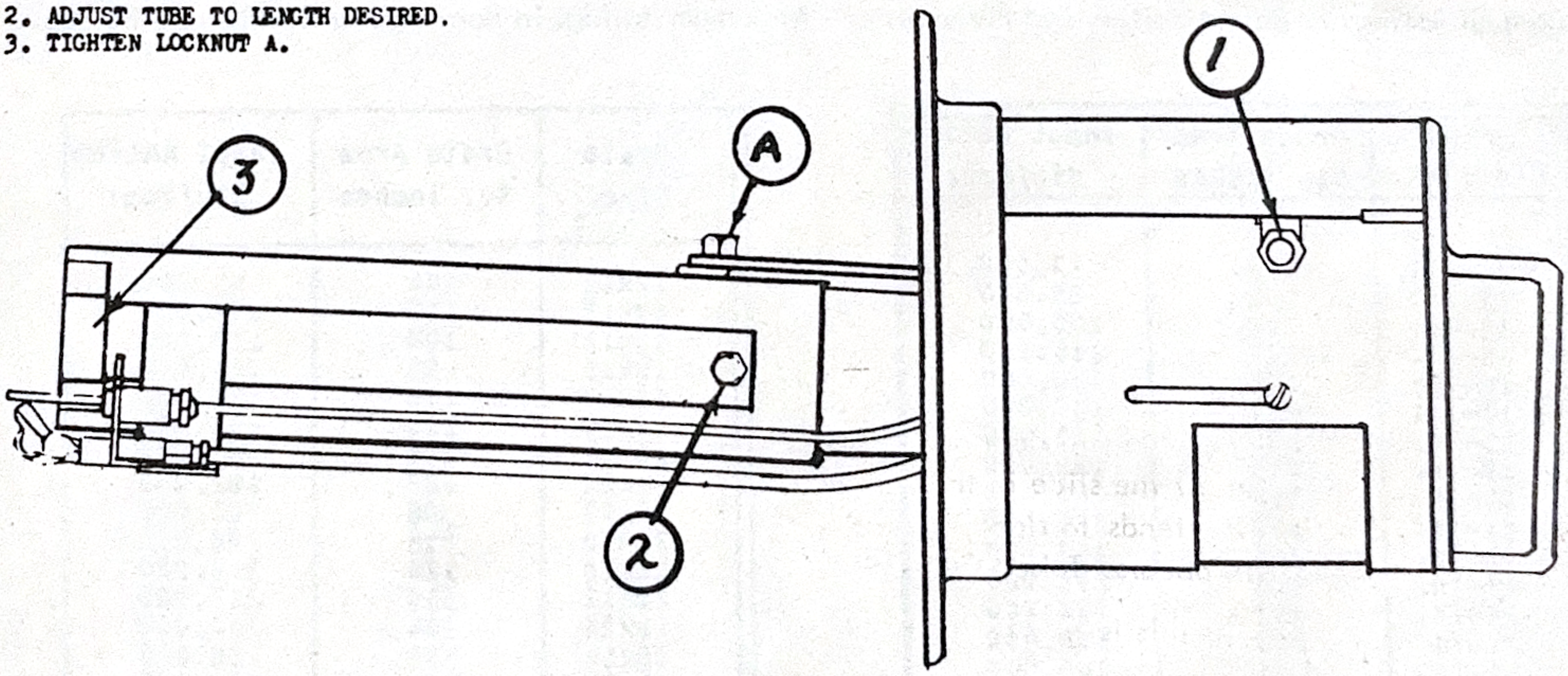

MATCH FLAME SHOULD BLOW OUTWARD
OPEN FIRE DOOR ABOUT ⅛-INCH
MATCH FLAME SHOULD PULL IN FROM BOTTOM

FIG. 8 MATCH TEST FOR CHECKING DRAFT

TO ADJUST TUBE

1. LOOSEN LOCKNUT A.
2. ADJUST TUBE TO LENGTH DESIRED.
3. TIGHTEN LOCKNUT A.



TO REMOVE PILOT

1. CLOSE PILOT COCK.
2. DISCONNECT PILOT LEADS.
3. DISCONNECT PILOT LINE AT CONNECTOR #1 OUTSIDE JACKET.
4. REMOVE LOCKNUT FROM CONNECTOR #1 AND REMOVE FROM JACKET.
5. REMOVE LOCKNUT #2.
6. SLIDE PILOT OUT OF CLIP #3 AND REMOVE PILOT.

TO REPLACE PILOT

1. INSERT PILOT AND SLIDE INTO CLIP #3.
2. SLIP HOLE IN BRACKET OVER SCREW AT #2.
3. INSTALL LOCKNUT #2.
4. INSERT CONNECTOR #1 IN SLOT IN JACKET AND FASTEN WITH LOCKNUT.
5. CONNECT PILOT LINE AT CONNECTOR #1.
6. CONNECT PILOT LEADS.

FIG. 9

TABLE II

* ORIFICE RATING CHART

DRILL SIZE DMS	NAT. GAS 3½" W.C. 1000 BTU GAS	DRILL SIZE DMS	PROPANE 11" W.C. 2500 BTU GAS	DRILL SIZE DMS	MFD. GAS 2½" W.C. 525 BTU GAS
#29	50,000	5/64	50,000	3/16	50,000
#20	74,000	3/32	75,000	15/64	75,000
3/16	100,000	#33	100,000	19/64	100,000
#4	125,000	9/64	125,000	5/16	125,000
15/64	150,000	1/8	150,000	11/32	150,000
1/4	175,000	#27	175,000	23/64	175,000
17/64	200,000	5/32	200,000	25/64	200,000
9/32	225,000	#20	225,000	27/64	225,000
19/64	250,000	11/64	250,000	7/16	250,000
5/16	275,000	#14	275,000	29/64	275,000
21/64	300,000	#10	300,000	31/64	300,000

* APPROX. ORIFICE SIZE NOTED THIS WILL VARY WITH GAS VALUE AND PRESSURE.

TABLE III

Maximum Ratings in Round Boilers and Furnaces

Grate Diameter	Grate Area Sq. Inches	Input Rating Btu/Hour
12-in.	113	73,000
13-in.	132	85,000
14-in.	154	100,000
15-in.	177	115,000
16-in.	201	130,000
17-in.	227	147,000
18-in.	255	165,000
19-in.	283	184,000
20-in.	314	204,000
21-in.	346	225,000
22-in.	380	247,000
23-in.	416	270,000
24-in.	452	294,000
25-in.	490	318,000
26-in.	531	345,000
27-in.	572	372,000
28-in.	615	400,000

Maximum Ratings in Rectangular Boilers and Furnaces

Grate Size	Grate Area Sq. Inches	Input Rating Btu/Hour
12x12	144	93,000
12x13	156	101,000
15x12	180	117,000
15x13	195	126,000
14x14	196	127,000
14x15	210	136,000
18x13	234	152,000
14x20	280	182,000
14x22	308	200,000
21x15	315	205,000
18x18	324	210,000
28x12	336	217,000
16x24	384	250,000
28x14	392	255,000
21x19	398	259,000
16x26	416	270,000
18x24	432	281,000
16x28	448	291,000
18x26	468	304,000
18x28	504	328,000
22x28	615	400,000